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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/580,193	05/23/2006	Klaus Hilmer	290924US0PCT	1804
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OBLON, SPIVAK, MCCLELLAND MAIER & NEUSTADT, P.C. 1940 DUKE STREET ALEXANDRIA, VA 22314				
EXAMINER				
BAUMSTEIN, KYLE				
ART UNIT		PAPER NUMBER		
4171				
NOTIFICATION DATE		DELIVERY MODE		
05/15/2008		ELECTRONIC		

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patentdocket@oblon.com

oblonpat@oblon.com

jgardner@oblon.com

### Office Action Summary

**Application No.**

10/580,193

**Applicant(s)**

HILMER ET AL.

**Examiner**

Kyle Baumstein

**Art Unit**

4171

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 23 May 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-12 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-12 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SF/ICE)  
Paper No(s)/Mail Date 5/23/06
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### *Claim Rejections - 35 USC § 102*

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1, 2, 4, 8-10 and 12 are rejected under 35 U.S.C. 102(b) as being clearly anticipated by Bhattacharyya (US Pat. 6142189).

3. Regarding claims 1, 2, 4, and 10 the instant application claims a method of producing a polyurethane polymer that is further cured by the addition of both aliphatic and aromatic isocyanates (claim 1). More specifically, the aliphatic isocyanate is claimed to be an isocyanurate having three isocyanate groups (claim 2) and the aromatic isocyanate is claimed to be a carbodiimide-modified diphenylmethane 2,2', 2,4', and/or 4,4'-diisocyanate (hereinafter MDI) and/or a prepolymer based on said MDI (claim 4). Also, the isocyanate compounds are added to the polyurethane polymer once it has been melted in an extruder (claim 10).

4. Bhattacharyya teaches a method of producing a high performance crosslinked thermoplastic polymer. The particularly preferred thermoplastic polymer is a thermoplastic polyurethane (col. 3, lines 51-54). An isocyanate or isocyanate mixture is added to the polyurethane once it has been placed in an extruder and subsequently melted (claim 5). The prior art discloses the use of triallyl isocyanate as well as diphenylmethane 4,4'-diisocyanate and states that mixtures of isocyanates and

polymeric isocyanates having functionality of more than 2.0 have been found to be particularly useful (col. 4, lines 13-20; claims 11 and 12).

5. Regarding claims 8-10 and 12 the polyisocyanates are added to the polyurethane such that 1 to 10 parts of isocyanate containing compounds are used per 100 parts by weight of the polyurethane (claim 8). Applicants claim the process of mixing the compounds wherein the polyurethane is fed into an extruder by way of a feeding aid where it is melted and mixed with the compounds having isocyanate groups (claims 8-10) as well as an article prepared by said process (claim 12).

6. The prior art discloses the process wherein the crosslinking agent, isocyanate mixture, is added to the polyurethane such that 1-10% is added based upon the weight of the polyurethane (claim 2). Furthermore, Bhattacharyya teaches the use of such a composition to make an article, a hose in this case, having increased heat and chemical resistance among other physical properties. As for the addition of the feeding aid in the extruder, the presence of this portion has no stated unforeseen effects on the inventive step of mixing the polymer components.

### ***Claim Rejections - 35 USC § 103***

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bhattacharyya (US Pat 6142189) as applied to claims 1, 2, 4, 8-10, and 12 above, and further in view of Sapper (US PGPub 2003/0032179).
9. The instant application claims the process of creating a polyurethane resin that is cured using aliphatic and aromatic isocyanate containing compounds. The aliphatic compound is claimed to be an isocyanurate with an NCO content of from 20% to 25% and with a viscosity at 23 °C of from 2500 mPas to 4000 mPas. Bhattacharyya teaches a process of creating a polyurethane cured with a mixture of aromatic and aliphatic isocyanate and also specifies that isocyanurates may be used as suitable cross-linking agents. However, the reference fails to specify the viscosity or NCO content of said isocyanurate.
10. Sapper teaches a polymer composition comprising a polyurethane that is cured in the melt with a mixture of isocyanate-containing compound. More specifically, Sapper discloses the preferred use of hexamethylene diisocyanate-based cross-linking agents (hereinafter HDI). The prior art teaches the use of blocked HDI-based compounds including polyisocyanates containing isocyanurates based on HDI (page 2, line 36-42). Preference is given to polyisocyanates containing 2.5 to 5 isocyanate groups and viscosities from 100-5000 mPas.
11. Due to the similarities of the polymers being cured by the isocyanate-containing components, it would have been obvious to one having ordinary skill in the art to have used an isocyanurate as is disclosed in Sapper as the aliphatic isocyanate generically taught in Bhattacharyya as the cross-linking agent. In order to create an extrudable

polyurethane resin, the amount of cross-linking must be within a range so as not to produce either of the extremes: a compound too viscous that would drip from the extruder or a compound too thick that extrusion is not possible. Furthermore, due to the large range of both NCO content and viscosity presented in Sapper, it would have been obvious to optimize such properties in order to achieve a final compound with the characteristics that are desired in the instant application.

12. Claims 5 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bhattacharyya (US Pat. 6142189) as applied to claims 1, 2, 4, 8-10, and 12 above, and further in view of Porter et. al. (US Pat. 5106874).

13. The instant application claims the process of making a polyurethane polymer using two isocyanate-containing compounds, an aliphatic and aromatic isocyanate. It is further claimed that the aromatic isocyanate is MDI that is added as a prepolymer based on said diisocyanate, an alkanediol with a molar mass of from 60 to 400 g/mol, and a polyetherdiol with a molar mass of from 500 to 4000 g/mol. More specifically, applicants disclose the preferred use of polypropylene glycol ether as the polyetherdiol in the specification. The prepolymer has a viscosity of from 500 to 800 mPas at 25 °C and an NCO content of from 20% to 25%.

14. Bhattacharyya teaches a process for making a polyurethane polymer comprising aliphatic and aromatic isocyanate groups. It is disclosed that a preferred embodiment of the patented invention consists of using a mixture of isocyanate(s) and polymeric isocyanate(s), yet the specific composition of the polymeric isocyanate is not taught.

15. Porter teaches a process for preparing a polyurethane elastomer by reacting a polyisocyanate and a polyether polymer. The polyether polymer used is specified as poly(propylene oxide) with an equivalent weight of about 1000 to 5000 (col. 4, line 10). The equivalent weight calculated in the patented invention is the molecular weight divided by the nominal number of isocyanate-reactive groups per molecule. Thus, a poly(propylene oxide) having the preferred functionality of about 2 would have a molecular weight of about 2000 to 10000. Such a polymer would be analogous to the instant application's claimed polyetherdiol. Porter goes on to teach the highly preferred use of a chain extender in the preparation of the elastomers, having a molar mass of about 60 to 600. More specifically, the invention comprises the use of alkylene glycols ranging from ethylene glycol to 1,6-hexamethylene glycol (col. 9, lines 13-22). Also, the prior art teaches the use of MDI as the especially preferred isocyanate to prepare the claimed polyurethane (col. 7, line 15).

16. Due to the nature of the polymer claimed in Porter, as well as the preferred embodiment of the use of an isocyanate prepolymer taught by Bhattacharyya, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have used said isocyanate prepolymer taught by Porter as that which is claimed generically in Bhattacharyya. Regarding claim 6, even though Porter does not mention the viscosity or NCO content of the prepolymer prepared, it is assumed that using the same components as those disclosed as preferred components in the instant application will result in a prepolymer having similar viscosity and NCO content as that claimed in the instant application.

17. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bhattacharyya (US Pat. 6142189) as applied to claims 1, 2, 4, 8-10, and 12 above, and further in view of Mark, et. al., eds. (Encyclopedia of Polymer Science and Engineering).

18. The instant application claims a process for creating a cured polyurethane resin comprising mixing a polyurethane polymer with an aliphatic and aromatic isocyanates in a ratio of from 1:1 to 1:10, respectively. Bhattacharyya teaches the process of creating a cured polyurethane resin that comprises mixing said polyurethane with aliphatic or aromatic isocyanates or a mixture of both. However, the prior art fails to teach a suitable ratio to be used for the mixture of the two.

19. Mark teaches the basics of polymer science. More specifically, when mentioning the building blocks of polyurethane polymers, the use of both aliphatic and aromatic isocyanates is discussed. Furthermore, the reference discloses that the introduction of isocyanate groups into a polyisocyanate increases the average functionality per molecule and the degree of cross-linking in the final polymer (page 254). To maximize the cross linking, one would need to add a greater amount of isocyanate, however doing so may cause the mixture to be too viscous so as not to allow it to pass through the extruder. Therefore, it would have been obvious to one having ordinary skill in the art that to maximize both the extrudability and cross-linking concurrently, one would need to optimize the ratio at which the isocyanate mixture is made and used as disclosed in Bhattacharyya.



20. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bhattacharyya (US Pat. 6142189) as applied to claims 1, 2, 4, 8-10, and 12 above, and further in view of Enlow, et. al. (US Pat. 6254712).

21. The instant application claims the process of creating a cured polyurethane by mixing a polyurethane resin with two isocyanate-containing compounds and extruding said polyurethane through an extruder having a barrier screw. Bhattacharyya claims a polyurethane polymer cured by the addition of mixtures of isocyanates. The prior art also claims the process of adding the components in the extruder, yet fails to teach the use of an extruder equipped with a barrier screw.

22. Enlow teaches the use of an extruder equipped with a barrier screw to process thermoplastic resins. According to the prior art, the use of the barrier screw shows improvements over the use of extruders without said screw, including reduced feed surging, resulting in a more stable melt, and a more stable output (col. 38, line 58). Due to the improvement in the final product, it would have been obvious to one having ordinary skill in the art to have used an extruder equipped with a barrier screw as is taught in Enlow as the generically claimed extruder taught in Bhattacharyya

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kyle Baumstein whose telephone number is (571)270-5467. The examiner can normally be reached on Monday-Friday: 7:30-5:00 with alternate Fridays off.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Larry Tarazano can be reached on 571-272-1515. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/D. Lawrence Tarazano/  
Supervisory Patent Examiner, Art Unit 4171

Kyle Baumstein  
Examiner  
Art Unit 4171

/KB/